

TANDY LAPTOP COMPUTING

DECEMBER 1989 -VOL. 6, NO. 10

TERRY KEPNER'S

portable 100

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A MONTHLY PUBLICATION (EXCEPT COMBINED JULY/AUGUST ISSUE)

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Checking it twice...
Santa should have it so easy.*





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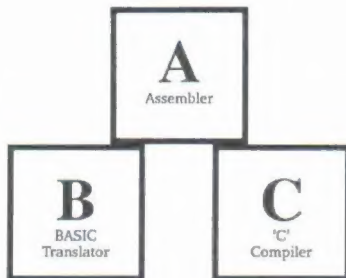
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ON THE COVER:

Christmas lists are always a problem, but Mike finds his computer a big help.

Photo and concept by Linda Tiernan.



SPC EXPORT SERIES HARD DRIVES FOR THE TANDY 1400.

by Bob Scott
Are your tired, huddled floppy disks longing to breathe free?

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Tandy 102

RUNNING DOS 3.3 ON A TANDY.

by Bob Scott
It isn't as easy as you would think it should be.

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EXTERNAL OR INTERNAL HARD DRIVES FOR LAPTOPS?

by Bob Scott
There are trade offs in both directions.

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Tandy 200

FORGET THE OPTION ROM: USE THE OPTIONAL EPROM!

by Craig Cox
Put an EPROM in your RAM slot for 8K of hard-wired storage.

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Tandy 600

INSIDE THE TANDY 600 (PART 1 OF 3 PARTS)

by Stevie A. Stark
A guide to the insides of the Tandy 600.

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I/O

THE IDEA BOX

NEW PRODUCTS

DEFUSR

FULL POWER

PORTABLE 100 CLASSIFIEDS

ADVERTISERS' INDEX

Coming Up...

Lord Byron, Lao-Tzu, and Lincoln, too.

A printer for our times (or Helvetica).

Interesting developments.

Of trapped disks and undefined keys.

Get the most from TEXT, pt. 3B.

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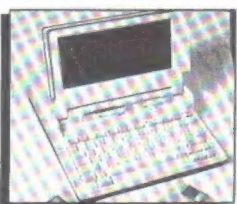
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Tandy 1400LT

ROM WITH A VIEW

Please look again at this month's cover photo. Please note that my finger is on my lip, not elsewhere! Thank you. Now I feel at least a little bit better.

Hey, it looks like *Portable 100* has already made it into the next decade! In the January 1990 issue of *MAD* magazine, "MAD's Maddest Writer," Dick DeBartolo, has struck again. Pick up a copy, look carefully at his piece entitled "Practical Joke Items for the Computer," and see if you can spot the references to *Club 100* and *P100*. Apparently, Dick has recruited *MAD* artist Al Jaffee in what could become the Great Magazine War of the 1990's.

What else can we (more seriously) expect in the new decade? How about a Model 100/200 mouse? James Yi has successfully adapted a Logitech C7 mouse to work with his Tandy 200. He's now applying his considerable talents to adapting the Logitech C9 as well. He'll show you how you can do it, too.

You'll also learn more about Tandy's nifty new WP-2 portable word processor, reviewed in last month's issue. We'll even add a regular WP-2 column to *Portable 100*, if possible. CompuServe's Model 100 Forum, meanwhile, already has a special area (Section 15) for discussions and info on the WP-2. Current forum messages confirm the *TELCOM* problems reported in my review. When we uncover the cause and/or solution, we'll share them in *P100*.

We'll evaluate the new Tandy 1100 FD as well. With *DeskMate* software in ROM, this compact laptop should be comparatively easy for beginners to use. Incidentally, WELTEC reports that their Portable Hard Disk (PHD), also reviewed last month, works just fine with it.

We'll begin to see more support for Tandy 1400's. Adtron, Inc., for example, has already produced two 1400-compatible expansion cards and is developing more. Their "Top Flight" game port card is sitting on my desk, awaiting the arrival of a joystick from C.H. Products. Once it arrives, it's party time—followed, naturally, by a review.

Ultrasoft Innovations says they'll finally begin shipping Ultra Card memory expansion in January, with the Ultra Graphics Adapter not too far behind. We'll shake 'em down for you the instant we get our mitts on 'em.

There's even more to come, but for now, let's return to the dreaded cover photo (which, by the way, wasn't my idea).

While it might look like some weird guy with his finger up his nose, it's actually meant to portray something more like "Nuge Thinking Real Hard." Making a list, checking it twice, and all that stuff. I'm sitting amid a few favorite things: a fireplace, my faithful Model 100, my Musicians Institute jacket (from my drumming days in Hollyweird, CA), Abuse Bear (don't ask!), and a copy of *MAD*.

Just between you and me, what I was *really* thinking was how awkward and uncomfortable I felt. I'm more at ease when playing the clown, like the gnarly old prospector on the October '88 cover.

What's most uncomfortable of all, though, is that my very favorite thing—my greatest treasure in the whole world—isn't in that picture. She's too far away.

We write each other letters. We send each other drawings, gifts, and photos. On the telephone we talk off family and friends, of school and play, of wishes, hopes and dreams. We laugh and sing the Scarecrow's song from *The Wizard of Oz*. And each day, she smiles at me from photos on my desk, on my wall, on the April '89 cover...

Yet you read my words far more often than she feels my hug.

Last Christmas my gift to you was a reminder that special people are hard to find, and that we too often take them for granted. Not on purpose, I know, but we still do it.

On behalf of my daughter and myself, please accept that same gift this year: If there's someone special nearby, put this magazine down for a moment. Go and give them a great big hug, and tell them just how special they are. Take all the time you need.

We'll still be here when you get back.

Warmest wishes,
Nuge

Toolbox

Manuscripts were typed into Microsoft Word 3.0 on a Tandy 1400 HD, where they were edited, spell-checked, and had basic format instructions inserted. From there they were loaded into a Tandy 4000 (80386 CPU, Tandy EGA Monitor, Tandy LP-1000 LaserPrinter) desktop computer and placed into Aldus' IBM PageMaker 3.01. Once there, design decisions on photo, figure, and listing sizes and placements were made. Here, pull quotes are placed, headlines, intros, and bylines are sized and positioned, and advertisements positioned.

Normally, the Tandy LP-1000 is capable of emulating only a Hewlett Packard Laser Printer Plus. But with the

addition of the Destiny Technology Corporation (300 Montague Expressway, Suite 150, Milpitas, CA 95035. (408) 262-9400) PageStyler 4.5MB kit, the LP-1000 is turned into a fully-compatible PostScript printer, with all 35 native fonts that are found in the Apple LaserWriter Plus printer. The Destiny PageStyler is available through the Tandy ExpressHardway system.

Page previews were output from the Laserprinter. When everyone was satisfied with the appearance, final pages were output and artwork and lineart ads were positioned. The finished magazine was then delivered to the printer, who printed it, labeled it, and mailed it to you.

portable 100

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LORD BYRON, LAO-TZU, AND LINCOLN, TOO

Even though the October '89 issue held little of specific interest to me, I do want to thank you for publishing at all—in addition to publishing on schedule. To be honest, I cross my fingers each month. (I'm worried about the cheaper paper stock and slender issues, though.)

Two articles did catch my attention, however. Michael Daigle's IDEA BOX was especially refreshing. I mean, how many other computer magazines have the intelligence to quote Lord Byron and Lao-tzu, and toss in Abraham Lincoln? And although I agree with the author in theory—a powerful computer does not make a powerful writer—I am frustrated by the 100/102's biggest drawback to being a serious writing instrument: screen size. All the above-mentioned writers had the ability to see all of their words at once; they didn't have to scroll eight lines at a time. It is for that very reason I'm writing this on a NEC Multi-Speed [We forgive you.—Ed.] rather than my 102, which is only a room away.

In addition, the 100/102 has never made real word processing easy. I find myself agreeing more and more with Peter Stanwyck's article in the December 1984 issue—these machines were never meant to be word processors. If it weren't for the small miracle of Ultrasoft Innovations' *Supera 3.0*, I might have set the 102 aside long ago. Even so, I've learned how to add formatting commands to my 102 text files so that they transfer—perfectly formatted, with italics, bold, etc.—into *PC-Write* on my IBM-compatible; I never print a finished document straight from the 102.

As for the second article that caught my attention—I'm amazed that a product such as *Hot Zone* would enter the market at this time. Tandy daisy-wheel support only? Italicized words have to be pasted in? Dot matrix, ink jet, and even laser printers have never been cheaper; I'd be surprised if most *Portable 100* readers don't own at least one cheap dot-matrix machine. So why would anyone produce a program that supports only one manufacturer's version of an uncommon machine? Baffling. (On the other hand, I realize that the software

to create different fonts on even Epson-compatible printers would probably knock a program out of the 32K league.)

I realize this is long. But at least you know your work is being read. Just remember, we wouldn't write to you if we didn't care about the magazine. Keep up the wisdom and wisecracks.

Bob Bittner
South Elgin, IL

M100 CLIP ART?

As a Tandy 200 owner, I really enjoy the magazine and find the articles and the ads useful. Because of those ads, I've bought two programs from one source, and *MacDOS II* at work from Traveling Software. That led a co-worker to order *LapDOS* as well!

*It shook me up,
because Michael
Daigle's story is
my story.*

Please continue your T200 support, and try to include the 200K Portable Disk Drive 2 as well as the original.

Can't someone come up with a *Print Shop*-style program for the 100/200, with clip art graphics stored on disk? Or how about a simple business graphing program, with Epson-compatible screen dumps for the line/bar/pie graphs?

Keep up the good work!

Jon C. Heath
Blue Springs, MO

WHAT A MACHINE!

Nuge, I would like to thank you per-

sonally for your great work and personal concern for the 100 community, Terry Kepner for his courageous support of the 100 community and for bringing you to the *Portable 100* staff, and Michael Daigle for his incredible May '89 article, "Confessions of a Hardware Junkie." It shook me up, because his story is my story.

I've bought almost every machine that has become available, overlooking the obvious choice for my purposes. I've learned *WordPerfect*, *Microsoft Word*, *Pagemaker*, *Ventura*, *dBASE III*, *Microsoft Works*, *WordPerfect Executive*, etc. Months—really years—of study. Faster machines (where does it end?) and larger screens (19-inch, 32 shades of grey), luggables, laptops (or so they say) ... a never ending parade of new features, bells and whistles ... and never a mention of REAL productivity. Hype and more HYPE!!!

Then a quiet voice whispered, "Model 102." Simple, not too fast, but instant, incredibly portable. It has its flaws, but WHAT A MACHINE! I listened. Not much at first. But I listened.

Something about it grabbed my attention, but just what, I didn't know until I read Mr. Daigle's article. I was moved and went out and bought one—not on impulse, but with insight. The best thing I could ever have done.

Within hours I was producing what would have taken months on the other machines. One week of use, and I am writing this letter after finishing the outline of my new book (using *Super ROM* from PCSG).

Needless to say, I've sold most of my other equipment, keeping only my 12-pound Toshiba 1200 as my home machine, and will be taking my M102 to work with me every day. It is the greatest little machine available, and the only true portable I have seen.

If it had not been for your magazine, I would never have discovered this wonderful machine and been able to achieve so much in so little time. I hope to see more articles on people using the M100/102 in real-life situations, and more—much more—of Michael Daigle's articles. Keep those reviews coming, and keep your sense of humor.

Thank you for your personal concern for a potential user, and for your continued concern after the purchase. I hope we users will never have to do without *Portable 100*.

Keith Leonard
Miami, FL

THE USUAL GANG OF EDITORS

OUCH!!! Once *Portable 100* disappeared from my local newsstand, I dug out an old, dusty issue and sent in the subscription card. After a bit of long-distance telephone tag and promptly returned calls by you, I tried to get into the *Portable BBS*. NO LUCK! What am I doing wrong?

I received my second issue (Oct. '89) today. "THE USUAL GANG OF IDIOTS" (INPUT/OUTPUT) really hit home. I read the "NOTEBOOK BBS" letter and tried your BBS again, and—WaaLaa—NOLUCK! As a matter of fact, after three tries via TELCOM, using :16039249770<=>, I tried to go on-line manually by dialing the number and pressing F4 (Term). Ring ... ring ... "The number you have reached has been disconnected." Did the "Friday the 13th Virus" hit the BBS and wipe it out? (Okay, maybe it's just me.)

How about the phone number for the 100+ BBS and/or Club 100 BBS? I'd love to support one, both, maybe even all three—but this IDIOT needs a bit of <H>elp! to get on-line! Thanks!

Danny Buelk
Tampa, FL

First, I should explain that "THE USUAL GANG OF IDIOTS," is MAD magazine's monthly byline for contributing artists and writers. Since MAD's Dick DeBartolo parodied our TOOLBOX in P100's October INPUT/OUTPUT, we used that line for our column header, as a good-natured poke at MAD (not at our readers!). When it dawned on me later that folks who haven't read MAD might misunderstand, I expected some angry mail. Happily, P100 readers are a humorous lot—so far, no letter bombs!)

Our BBS number has never been disconnected, so I can't explain the intercept recording you got. We occasionally take the BBS off-line for maintenance or to use the line for company telecommunications, during which time callers should get either a busy signal or no answer. Your log-on string seems fine, but you can probably eliminate the pause (=) between the angular brackets (<>). Try the BBS again and call our office if you still have trouble.

The Club 100 BBS number (415-939-1246) is listed in their PORTCOMM (The Portable Communicator) ad. The 100+ BBS

number (703-525-1256) was indeed omitted from the "NOTEBOOK BBS" letter. (Perhaps I'm the one who should feel like an idiot!)

-MN

HELP!

About two years ago I inherited (no one else wanted it) a Model 100. I did not do much with it until I hooked up with the Dow Jones News/Retrieval service. Then I discovered your magazine, which began to show me what the Model 100 could do. Now I have two problems, and I need your help.

First, following the information in "GETTING WIRED" (Nov. '88), I can successfully link up with the *Portable BBS*. I receive the welcome message, and then I am asked for my first name. Unfortunately, the keys I hit do not appear on the screen, or a different letter appears, or I get no response to the keystroke. Why?

The second problem involves Super FAX (Summer '89). I make my connection with CompuServe and receive the following message: COMPUSERVE INFORMATION SER^P. The function key labels change as follows: F1—Scan,

**We used that line
for our column
header as a good-
natured poke at
MAD (not at our
readers!).**

F2—Call, and F8—Exit, and the keys do not respond to the keystrokes. I must press the reset button to get back to the main menu.

I created the ADRS.DO entry exactly as shown in the article. I created my text file using the New file choice from Write ROM. I put my cursor bar over the text file name before pressing the Find function key. When I used Set to establish limits and tried to set L/P to 56, I received the message that 56 was Too small.

I hope the above provides you with enough information to analyze my problem with Super FAX, as the use of this function would be a big help with my business communications as I travel.

Ric Pennisi
Brentwood, TN

INPUT - OUTPUT

Need to get analog voltage or digital switch information into your M102?

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Circle 88 on reader service card.

Try this: Back up all your files and cold start your computer. (While holding down the CTRL and BREAK/PAUSE keys, turn the computer off and then on.) Next, set your TELCOM stats to M8N1E. Now press F2 (Call), type 1-603-924-9770<> and press ENTER to manually log onto the *Portable BBS*. This eliminates any possible software conflicts. Once connected, check that the label above F4 says Full; if it says Half, press F4 once.

You should now be able to log on fully, and characters you type should appear properly on your screen. If not, then you might have a hardware problem (most likely in the modem circuitry, since you don't complain of keyboard trouble in general). If possible, try the same thing with another Model 100/102 or 200.

If, on the other hand, it does work, it would seem to indicate that your problem was caused by some unknown software conflict (which, incidentally, the cold start may have cured permanently).

Then if Super FAX still chokes, check that your CompuServe log-on options aren't set to run EasyPlex directly when you have mail waiting. (See "ATTENTION SUPER-FAXERS!" October '89, INPUT/OUTPUT.) Also contact the author, Ronald Cameron (CompuServe ID 72246,2557), via EasyPlex or on the Model 100 Forum.

And finally, setting PL/P before L/P will prevent that Too Small message. Good luck!

-MN

?IO—CORRECTIONS

We probably screwed up something somewhere, but we haven't found it yet. Don't worry, something will turn up, and we'll report it here next month!

-MN

A Printer for Our Times (or Helvetica)

When we talk about expanding the Model 100, the mind automatically conjures up visions of additional RAM and ROM chips, of memory cards and Booster Paks. But there are other ways to pump up your portable. This month, I'd like to depart from my usual lofty ruminations to focus on the printer version of the Model 100: the Diconix 150 Plus ink jet printer from Kodak.

I've seen this little gem before. About a year ago, when I had my Macintosh, I remember a dealer coming to the local Mac user's group to show the *original* version of this same printer. He was touting it as the ultimate portable printer, an honest-to-goodness ink jet printer that could print out 300 dot-per-inch (dpi) documents that would make a \$500.00 ImageWriter II™ hang its print head in shame. He even went as far as to call it "a poor man's laser printer."

In that sense, I suppose you could call me "a poor man's Tom Selleck."

The printer was not perfect. Far from it. I looked, I saw, I yawned, I left. I hadn't thought about it again until I got a call one night from Mike Nugent, techie extraordinaire and the only man I know who dreams in hexadecimal. He wanted me to take a look at the new 150 Plus and give my opinion. I explained that I'd seen the old version, and that I'd been impressed enough to keep the brochure in my bathroom in case I ever ran out of toilet paper. He still wanted me to review it. OK, I said, smacking my lips and thinking of the scene in "Jaws" where the shark swims up and bites off the back half of an entire boat. Sure, Nuge. I'll review your little printer (heh, heh) ...

Well, it came, I looked, I used, I was surprised. For the most part, pleasantly surprised.

The old 150 required the use of special "ink jet paper," which uses a special coating to enhance the appearance of ink jet printed documents. If you didn't have

the paper, you might as well not use the printer. Well, the new 150 Plus does NOT require that paper. Unless, of course, you care to actually READ what you print. In that case, do what the Kodak manual says in the section titled "Maximizing Quality." I quote: "1. Use ink-jet paper." Too true.

My standard test print document was a one-page letter, single spaced, with sections containing underlining, italics, emphasized print, and double-width characters. The letter was printed four times at 10 characters per inch (cpi), once each in draft (high speed, 145 cps), NLQ (near-letter quality, a compromise be-

*When I said
the Diconix
is small and light,
I wasn't kidding.*

tween speed and appearance, 44 cps), quality (the best output available, 29 cps), and condensed (small, 235 cps!) modes. These four modes are selected with a switch on the 150 Plus control panel or by control codes sent to the printer.

On plain paper, the same 20-pound, laser-cut clean edge paper I use in my regular 9-pin dot matrix printer, the draft mode produced a document that looked as if it was typed in smoke. The characters were barely visible at all. The NLQ version was as smooth and solid as Charles Manson's defense plea. The

quality version was suitable for reading if you had (1) a very strong light, (2) a good pair of glasses, and, (3) somebody behind you with a gun to your head shouting "Read this!"

Undaunted, I loaded some ink jet paper into the little toad and tried again. Oh my. What a difference. The draft mode on ink jet paper looked almost as good as the quality mode on plain paper had. The NLQ mode looked even better, and the quality mode flat out knocked my socks off. The 150 Plus can do very nice printouts (still not as nice as a good low end 9-pin dot matrix printer like the Panasonic 1180 or the Star NX-1000, but close), but ONLY on the special ink jet paper. Printing on plain paper using this printer is like producing the Magna Carta in crayon—you CAN do it, but please, don't.

But this ink jet cloud does have one silver lining: noise. Actually, the total and complete LACK of noise. Having heard of the Diconix's reputation as the quietest portable around, I decided to give it the acid test, which goes as follows: (1) Put my wife Elizabeth in front of TV. (2) Put Elvis movie in VCR. (3) Push PLAY. (4) Wait for love scene. (5) Put printer next to wife, and start self-test mode. (6) Hide.

That's all there is to it. If, when the printer starts operating at the same moment Elvis does, Elizabeth doesn't stop the movie to remind me that her brothers know places in the Oregon woods where a body would take YEARS to be discovered, well sir, that is one QUIET little printer. I'm pleased to say the Diconix passed with flying colors.

For some reason, margins on the Diconix do not correspond to margin settings with other printers. You can print documents only about 7 inches across, but that's not the problem. The problem is that if you set the margins to print your document out on your home printer, the margins in that document

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will have to be changed to print out correctly on the Diconix. It's no big deal, but it shouldn't happen at all.

The Diconix is powered by 5 "C" cell NiCd batteries stored in the hollow platen of the printer. It is a very clever design and one of the main reasons that the Diconix can claim the title of smallest, lightest portable printer sold today. The NiCd's can be recharged whenever the printer is plugged into the AC adapter included with the printer. Sadly, a full 14-hour charge will get you less than an hour's worth of printing, but such is the sorry state of battery technology at this time; one can hardly blame Kodak. Still, an unplugged hour's use per day is probably enough to satisfy most users' needs. In a pinch, you can pull the NiCd's and run alkaline "C" cells instead (don't tell Kodak I told you this; I'm sure they would be less than pleased, solemnly shaking their corporate heads and

muttering about voided warranties under their corporate breath). Of course, if you do this, be SURE to remove the alkaline batteries before using the AC adapter—the Diconix is not certified explosion proof.

When I said the Diconix is small and light, I wasn't kidding. Under 11 inches wide by 7 inches deep, the 2-inch tall printer fits into a briefcase, duffel bag, or oversized purse with plenty of room to spare. And its weight (with batteries) of under 4 pounds means that you can take it along and probably not even notice you're carrying a printer at all.

After all, that's what the Diconix is made for: portability. To save room, there is no platen knob sticking out the right side of the case. A simple, well designed plastic dust cover for the Centronics port is provided. The hinged printer cover is secured magnetically so it won't flop around during transit. It's

built to travel, all right. But will it?

Do you really NEED a portable printer? If you had one, would you use it enough to justify the \$499.00 (street price considerably less) expenditure? Only you can answer that. For my part, I can tell you that I am impressed enough with the Diconix to find myself seriously entertaining the notion. It's quiet, efficient, well designed, and functional. If you go in with both eyes open and can live with the printer's limitations, you can be quite happy with it.

Just ask my wife: She's been saying that about me for 12 years now.

by Michael Daigle



COMPATIBILITY: Tandy (and Toshiba) PC-compatible computers

SPC Export Series Hard Drives for the Tandy 1400

Are your tired, huddled floppy disks longing to breathe free?

by Bob Scott

As an old Model 100 user and CP/M throw-back, I was initially awestruck by the disk storage available on my new Tandy 1400LT MS-DOS laptop. The two 720K disks could hold seemingly limitless amounts of data and programs. This pleasant delusion continued for about two months, when I first tried to run *Harvard Graphics* on my new toy. The result? One creative week of batch programming, and "non-standard" installation procedures, that allowed me to run a subset of *Harvard* from floppies ... after booting with a third disk first ... I think.

Despite the perverse pleasure I took in jamming bulky programs on one or two floppies, I began to wonder what life would be like with a hard disk drive. After agonizing over the internal vs. external issue (laptop computing's eternal dilemma) I decided to investigate the market for external 1400LT compatible drives. (See sidebar for the pros and cons of external drives.) As I was gathering nuts and berries to sustain myself on this quest, along came good fortune (in the somewhat unsettling guise of Mike Nugent) to offer a review sample of System Peripherals Consultant's new Export series transportable hard drives.

DESCRIPTION

SPC Export drives consist of four subassemblies: the disk module, the docking module, the interface card and the power supply. Let's look at each:

• **Disk Module:** This is the proverbial "black box," measuring 7 x 4.5 x 1.75 inches. It consists of a 3.5-inch hard disk drive surrounded by a custom black-anodized aluminum shell and equipped with a specialized connector at its rear edge. The modules are available in sizes of 20, 30, 40, and 80 megabytes. The review system was furnished with both 40 and 80 Mb modules.

• **Docking Module:** The disk module slides into this unit, which contains the hard disk controller and an interface cable. Connected together, the disk module and docking module form a package measuring about 8 x 4.5 x 2.75 inches.

• **Interface Card:** The controller card in the docking module is connected to the computer through an interface card inserted in an expansion slot. Interface cards are available for the Tandy 1400LT and all Toshiba laptops except the T1000. Of special note, SPC also makes an IBM PC/AT-compatible interface (the "Bridge Card"), which allows the Export drives to be connected to any PC-compatible computer. You can configure all

interface has the necessary power connector.

• **Odds & Ends:** Also furnished is an attractive padded leather carrying case large enough to hold the assembled drive and docking module. Your main concern with this will be keeping track of

MANUFACTURER'S SPECIFICATIONS

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(619) 693-8611

Export Disks are available in the following configurations. Prices include disk, docking module, interface card, and power supply:

20 Mb	\$ 795
30 Mb	\$ 995
40 Mb	\$1095
80 Mb	\$1695

Additional disk modules are available for \$395 less than the price above (e.g., a 40 Mb disk module alone would cost \$700). Although not stated, I presume the docking module and interface card are available separately for \$395. The PC/AT Bridge card is \$195 separately, or \$145 when purchased with a drive system.

SPC has recently begun shipping a lower-cost disk system called the LHD series. These drives are permanently installed in a housing with an AC power supply. Although they provide similar performance to the Export series, they are not as readily transportable. Prices for these units are \$200 less than the equivalent storage Export drives. You may wish to contact SPC for further details on this product.

This is particularly important if you share a PC with others.

interface cards to use the Export hard disk as the DOS boot device. Disabling this feature allows use of the Export drives on hard disk equipped computers such as the Toshiba T1200 or an IBM PC/XT. (Other reasons to disable this feature are discussed below.)

• **Power Supply:** Your typical "brick," measuring about 5 x 3 x 2 inches and supplying the drive with +12 and +5 volts DC. If the drive is connected to a desktop PC using the Bridge Card, this supply is not needed. The Bridge Card

it; my wife stole the one shipped with the review unit.

Assembled and attached to your computer, the unit is easily placed beside or behind the 1400LT. Sufficient cable allows it to be placed beside the monitor of a PC clone when using the Bridge Card. Since the drive needs little attention, it needn't be located on prime desk real estate; mine happily perches atop my modem and 5.25-inch drive, effectively using no additional desk space.

If you're accustomed to typical mass-market items, the sleek black enclosure, unadorned with advertising, may take some getting used to. Next to the 1400LT, it looks like a Norton Commando that wandered into a moped parking lot.

The flexibility of the modular Export system is the key to its usefulness. For example, you could attach an Export system to your 1400LT at home and add a Bridge Card to your office XT. Transferring data would then be as simple as unplugging the docking module assembly and carting it in with you.

Ah, but the fun's just beginning. You now not only have your data, but also *your* word processor, *your* utilities and dictionary and all configured the way *you* like. You've effectively transported your entire "computing environment" to the office. This is particularly important if you share a PC with others and have grown tired of having your data or default settings fiddled with.

If you're looking for the ultimate in convenience, purchase a docking module for all your computers and disk modules for all your computer users. Then each person can move up to 80 Mb of data by just unplugging and transporting the small disk modules, which fit easily in an overcoat pocket. Cheap? No, but if you need it, it works.

For those dealing with classified defense data, or proprietary company information, the Export also provides a simple way of securing your dark secrets. Just unplug the disk module and lock it up or take it home.

INSTALLATION

Hardware installation is a snap, but you may not guess that from the instructions. SPC must sell most of their drives to Toshiba owners; you won't find any references to the 1400LT within the 8-page installation manual. An obtuse sticker on the front advises you to "disregard the use of the word Toshiba" therein and to apply all software instructions to the 1400LT. After some philosophical reflection, I decided that the instructions for the Toshiba T1100 would

probably be appropriate and proceeded with the installation of the 40 Mb drive.

The initial step is to remove the cover

**This is important if
you have grown
tired of having
your data or
default settings
fiddled with.**

from the 1400LT's expansion slot (above the printer port) and insert the supplied adapter card. The card uses the lowermost series of guides and is a snug fit when driven home. Properly inserted, it should slide in easily up to the last inch of travel. Firm pressure will then seat the card in the expansion connector. The screws that held the expansion slot cover in place can be used to secure the interface card further, if desired. My only complaint about this component is cosmetic. The backing plate is unpainted

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aluminum and hence looks somewhat odd when installed.

Next, the drive is inserted into the docking module and the docking module's DB-25 connector is connected to the socket on the rear of the adapter card. About 18 inches of cable are furnished to allow easy placement of the disk drive on your desk.

Finally, connect the power supply to its special connector (also at the end of the ribbon cable) and the easy part is done. Installation on a desktop PC is similar, with a half-card sized interface (that accepts the drive control and power connectors) installed in any free PC bus slot.

Power up the drive and computer and you're off ... almost. Unfortunately, the version of MS-DOS 3.2 furnished with the Tandy 1400LT is missing several critical hard disk management utilities needed to format the drive properly. Although there are a number of ways out of this trap, the easiest is to switch to MS-DOS or PC-DOS 3.3. (See the sidebar to learn how to run PC-DOS 3.3 on your 1400LT—without losing your clock, your RAM disk, or your mind.) Once you make the 3.3 plunge, all that's left is to boot the system from a DOS floppy and format the drive.

Formatting the smaller disks is done by accessing a ROM-based formatting

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HARDWARE REVIEW

routine via the *DEBUG* program. Once started, you answer several questions about disk parameters (using information supplied in the SPC manual) and perform the ritual of entering the bad sector list from a sticker on disk. The low-level formatting process then starts and you've soon got an "initialized" drive. Finally, the drive is partitioned using the DOS *FDISK* program and high-level formatted using the DOS *FORMAT* command.

Formatting the 40 Mb unit is similar, except that the *FDISK* program must be used to create two DOS partitions on the disk. As a result, you'll have two "logical" disks on the drive, one of 32 Mb (the DOS limit) and one of about 9 Mb (the remainder of the disk space) that are accessed as drives C and D.

What if your application demands 40 (or 80) Mb of data space on one drive? Or what if you just don't want to fool with logical drives? SPC provides the answer to this problem in the form of *SPCFMT*, a special formatting program which will format any Export drive into one, or many, partitions. This program provides all the functions of *FDISK* and *FORMAT* and handles the low-level disk format usually done by the controller ROM.

One drawback to this approach is that a special device driver (furnished) must be loaded into DOS via your *CONFIG.SYS* file to access the disk. Additionally, you may need to modify your copy of DOS to handle a different disk sector size. Although both of these processes are well explained, and fairly painless, they do have some important implications. First, you cannot use the single partition drive as a boot device (you must boot from a floppy) and second, you will sacrifice a small amount of RAM to the device driver (about 3K). One other problem is that some commercial disk "fixer-uppers" such as *Norton Utilities* and *Spinrite* may refuse to deal with the device driver. This can leave you without a card to play if you need to recover lost data or tune-up your drive. Unless you really need the space, I'd recommend starting with multiple partitions. You can always change your mind later and reformat the disk as a single partition if desired.

TO BOOT OR NOT TO BOOT?

I mentioned earlier that the computer interface card can be configured (via a single jumper) to force the machine to boot from the Export drive, or to ignore

Running DOS 3.3 on a Tandy

If you want to run MS or PC-DOS 3.3 on the 1400LT you'll soon discover quite a crop of minor problems. Here are these annoyances, and their solutions:

RAMDISK.SYS

Yep, it won't work! Attempting to load *RAMDISK.SYS* under DOS 3.3 produces a *Wrong DOS Version* error message. This is pretty frustrating when *RAMDISK* provides the only practical use for the additional 128K of RAM the 1400LT supplies above 640K. The fix, as it turns out, is pretty simple and only requires patching a byte or two in the driver where it checks the DOS version number. This test is supposed to prevent your accidentally running a driver under a DOS that it may not agree with, but it also keeps you from even testing the compatibility. Not surprisingly, *RAMDISK* runs fine under 3.3 and 4.0 once you make the change with *DEBUG* or a disk editor. Space precludes a full description of this process here, but it is detailed in a shareware package called *LTDOSC.ZIP* available on CompuServe. (This file lives, last time I looked, in the *TANDYPRO* forum Data Library 5.) The

file also contains solutions to most of the other difficulties listed below. The author, Robert Jacobs, requests a donation of \$5.00 for use of his programs.

FLOPPY DISKS

DOS 3.3 insists on thinking that the 1400LT has 360K drives installed in it. This is only a problem if you decide to format a floppy, when DOS will only format it to 40 tracks, or 360K bytes. Although you can get around this with *DRIVPARM* statements in your *CONFIG.SYS* file, it generally winds up giving your floppies two logical names (e.g., A and D). Not very elegant. The solution here is also available on many bulletin boards as a program called *SETDIS.ARC*. The tiny *SETDRIVE* executable file, when included in your *AUTOEXEC.BAT* file will directly modify the device table in DOS, fixing the 360/720k split personality. This program is available on CompuServe in the IBM Hardware Forum, Data Library 1.

CLOCK

For whatever reason, Tandy placed the hardware time clock in some place

that a normal DOS can't find it. The upshot is that you will have to manually enter the time when you boot the computer. Your other option is to write a program that will read the 1400LT clock and then plug the correct time into DOS. (For you hackers, interrupt 1A called with the value 2 in the AH register will return the hours, minutes and seconds in registers CH, CL and DH respectively.) Such a program is contained in file *PATCH.ZIP*, and it will set the DOS clock when included in your *AUTOEXEC.BAT* file.

FLOPPY STEP RATE

PC-DOS 3.3 defaults to a glacial floppy head step rate of 6 ms. This not only wastes time, but it also makes your floppy drive sound like a food processor chewing rocks. The solution here is to use a bulletin board utility such as *STEPRATE.EXE* to reset the head step to 3 ms (the normal Tandy default). This is then included in your *AUTOEXEC.BAT* file.

-Bob Scott

it during the boot process. The primary function of this option is to allow the Export to be used with computers that already have hard disks, such as the Toshiba T1200, without interfering with their boot process. It has a special significance for 1400LT owners, however.

Two unique "features" of the 1400LT may convince owners to boot from a floppy rather than the Export. First, the Tandy will wait an eternity (well, okay, a minute) to see if you'll feed it a floppy disk before moving on to the hard disk. You can shave about 30 seconds off the boot process by starting from a floppy.

Second, and perhaps most serious, the 1400LT will refuse to boot at all if the (boot configured) interface card is installed in the machine and the Export is not connected. This means that before you drag your 1400 off to the woods for a session of preternatural musings, you better pull the interface card—or free up some room in your rucksack for a Honda generator to run the drive.

One possible solution to the latter problem is to install an external switch connected across the boot jumper of the interface card. Then all you'd have to do is flip it when you unplug the drive and take off. (If you hesitate to make such a modification, I'm sure a call to SPC would net their charge for doing the dirty deed.)

A couple of final notes on this subject. The computer *will* boot from a floppy, just like an XT, if it finds one in the drive when the Export drive is connected. Hence, it is not necessary to remove the boot jumper if you want to boot from the floppy with the Export attached. These problems are not a defect in the drive, but rather are byproducts of the Tandy BIOS ROM's.

PERFORMANCE

These drives are *fast*. The 40 Mb drive is rated for a 35 millisecond (ms) step rate (recently upgraded to a 24 ms unit), and the 80 Mb is a blazing 15 ms. Either is a startling change from a floppy-based system. Launching my favorite word processor from floppy takes thirty-three seconds; the 40 Mb Export can do the same task in about six. Although I do not think the 1400LT can use the full potential of either of these drives, they are certainly faster than any battery-powered internal I've seen for the Tandy. Of note however, both drives returned a mediocre score of only 0.6 on the Norton disk test. (This is likely more a function of the Tandy I/O bus than the drive or controller.)

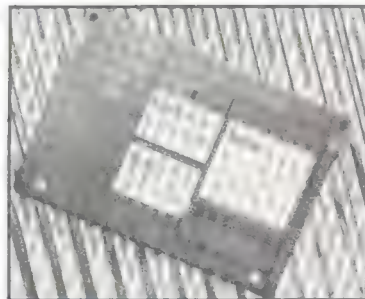
Initially I was disappointed with the performance of the 40 Mb drive. Run-

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ning Gibson Research's *SPINTEST* program on the drive pointed up the problem. SPC's suggested interleave factor of 3:1 was simply too fast for the Tandy to handle. Switching to a less frantic 4:1

They are faster than any battery-powered internal I've seen for the Tandy.

boosted throughput from a plodding 30K bytes/sec to a respectable 104K bytes/sec. I would strongly recommend that 1400LT owners disregard the SPC instructions in this area and format any of the Export drives for a 4:1 interleave. The extra speed is quite noticeable.

During the review period I thrashed both disks with every test program I could lay my hands on. I loaded the drives with all my usual software and used them heavily for a week. The 40 Mb drive was left running all night, reformatted several times and subjected to a detailed analysis by the Gibson *Spinrite*

program. In all this time I experienced only one problem. A brief power failure completely zapped the 40 Mb drive. Wouldn't boot, and DOS refused to admit it existed.

Assuming I'd experienced Hard Disk Hell (head crash), I gingerly started a low-level format and was surprised when it finished successfully. Curious, I restored all my software (from a disk backup I had fortunately just done) and started a commercial disk tester. I was again surprised to find no problems. A call to the manufacturer solved the mystery. It seems my particular controller may, when powered up, writes garbage to the drive. If the heads are parked, this is not a problem, but if it occurs with the heads over the DOS tracks, you're out of luck, sailor.

After discovering this malfunction, SPC designed and incorporated a "power-on reset" circuit in their current controller cards to spare their customers this particular gremlin. Magazine writers, however, get paid [*Poorly*.—Ed.] to brave these hazards. Good thing, too. As I was preparing to send this deathless prose in to P100, the gremlin struck again, destroying my only copy. I was annoyed. To say the least.

Operation of the 80 Mb drive was less traumatic. As I noted above, the speed difference was not detectable on the

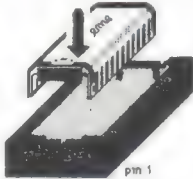


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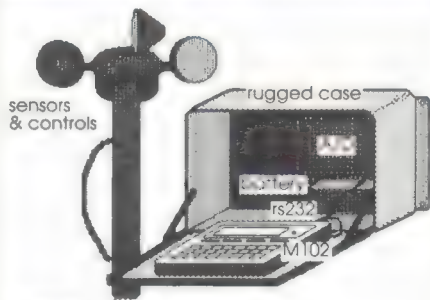
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HARDWARE REVIEW

1400LT, but the storage difference certainly was! I configured this drive as a contiguous 80 Mb drive C and was suitably impressed to see 68 Mb free even after loading all the software I own. The 80 Mb drive also ran considerably cooler and quieter than the 40 Mb.

Time constraints prevented me from testing the Export drives on a desktop PC as fully as I would have liked. Connecting and starting the drive on a Tandy 286 machine took only about 20 minutes.

Since the Bridge Card furnished for the review was not equipped with a boot ROM, I was unable to test the Export as a boot device. Other than that, it worked seamlessly with the little Tandy 1000.

Problems? Complaints? I've got a couple. First, the two failures I experienced are simply inexcusable. For this amount of money, you should get a reliable product. SPC assured me that this problem has been fixed, but you may want to check out their return policies

External or Internal Hard Drives for Laptops?

Once you've made up your mind to move into the land of fixed disks, your first decision is whether you want an internal or external unit. Although you can drag an external disk with you, for purposes of discussion let's assume that an external drive would be left on your desk when you hit the road, and an internal would naturally be brought with you. So, what are the trade-offs?

STORAGE

If you just can't run what you need to run on the road with floppies, you're going to have to use an internal unit. Programs that demand this are integrated systems (*Enable*, *Framework*, etc.), database programs with large data files (like the parts list to the Space Shuttle), or bloated applications such as *Lotus 123* release 3.0. Most of us, however, only need to do some telecommunication, writing, or computation on the road that can be handled by floppy-based programs. As an example, I can fit the following into one 10-disk holder:

- PC-Write or Microsoft Word v3.0
- PROCOMM
- Quick Basic and QB Advisor
- Lotus 123 v2.1
- RightWriter
- PC Paintbrush
- LaserJet fonts for PC-Write
- Two blank disks

This is generally enough to get me out of any tough spot I may find myself in on the road.

BATTERY LIFE

Externals win this hands down. Most internal hard disks will cut your battery life in half, or worse. Some pull so much power that they will run the 1400LT battery flat even when it is connected to an AC adapter.

PERFORMANCE

Externals take this as well. Because of steps taken to minimize battery loading, and to protect the hard drive from unexpected bumps, internal drives are usually miserable performers. Expect to see little speed improvement over a floppy-based system.

COST

This is beginning to look like an ad for external drives, but the fact is that you can purchase a fast 40 Mb external drive for about the same price as a slow internal 20 Mb unit.

COMPLEXITY

All internal drives that I've seen require installation by a technician or a hardware-smart owner. Owner installation generally voids the computer warranty and may make future servicing of the computer difficult to obtain. These serviceability problems can be avoided by using a Tandy-approved hard disk, and having it installed by a Tandy service center. Yes, it's expensive.

QUIETNESS

Internal hard disks can be quite noisy and may be a distraction if you're working in a quiet environment. Obviously, this is less of a problem if you're finishing a trip report while flying home in a DC-3 than if you're taking notes at a Papal audience. External drives aren't especially quiet, either (the 80 Mb Export is an exception), but they generally make noise on your turf, where you won't offend anyone else. If you just hate noise, period, you better listen to any drive before you buy it. You may not think floppies are so bad after all.

-Bob Scott

just in case.

Second, the drive activity light on the disk module comes on and off as it pleases. It provides no indication of disk activity. Now, there is an LED on the docking module that does light when the disk is accessed. Unfortunately, it's mounted underneath the disk module, where it can't be seen. I would like to see dual LED's mounted on both sides of the docking module (which would be visible regardless of how you placed the disk/docking module) or circuitry incorporated in the controller to correctly drive the light on the disk module.

Third, the documentation is pretty sparse. I would normally rate this a fatal error, but SPC provides a toll-free telephone support line manned by highly competent technical personnel to help out the installation novice. My calls, and

For the money, you get quite a flexible arrangement, allowing both data storage and transport.

those of the P100 staff, were all quickly and professionally handled. This service, and the unusual SPC one-year hardware warranty, are both worthy of emulation by others in the industry.

Finally, this drive produces an incredible amount of electromagnetic interference (EMI). Although you may not notice this on home TV's or radios, it can be quite a problem around sensitive equipment.

One of the primary applications for my 1400LT is connection to a sophisticated radio data decoder, which, in turn, is connected to a high frequency ("short-wave") receiver. Using this setup I can receive Morse, Baudot Teletype and ASCII data off the air, along with radio fax charts and photographs. The 1400LT is the display and controller for these operations and must be turned on while I use the radios.

An attraction of the 1400LT for me was that it is fairly quiet—it produces little EMI. However, connecting the Export drive controller to the system rendered my radio system virtually in-

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- Supports home Televisions (40x25) with optional RF modulator
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- Supports the 5 ROM applications (BASIC, TEXT, TELCOM, etc..)
- Data Interface: System bus 40 pin
- Data Connector: 40 pin male/female (specify 100 or 102 when ordering)
- Power Consumption: 6-volt/200 mA (AC Adapter included)
- Weight: 8 ounces
- Color: Black
- Dimensions: (LxWxH) 11.5" x 2.75" x 0.875"
- Software Driver: 1.8K ram, relocatable (Specify cassette/disk)
- RS-232 interface unused
- Option ROM socket unused
- Monitor not included as shown
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operable due to noise. The only solution is disconnection of the drive cable and rebooting from a floppy disk.

The interface cable seems to be the primary culprit in this problem, as it is an unshielded length of ribbon cable. Were the system mine, I think I'd replace it with a shielded round cable ending in a metal hood and connector (such as the one used by IBM on their external 3.5-inch drives). I think this modification, and careful attention to grounding, would significantly reduce this annoyance.

CONCLUSION

Is this thing worth the money? It depends. Hard disks for laptops are all expensive, and the Export is no exception. For the money, you do get quite a flexible arrangement, allowing both data storage and transport. This fact, coupled with the excellent after-sale support provided by SPC lead me to give this device a tentative "thumbs up." My hesitancy is from being unable to test the improved controller to see if they have licked the data loss problems I experienced. All in all, though, I'm going to be sorry to see my little review unit winging back to San Diego when the testing is done.

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Forget the Option ROM: Use the Optional EPROM!

Put an EPROM in your RAM slot for 8K of hard-wired storage.

by Craig Cox

If you own a Model 102, you can store your machine code or BASIC program on a standard EPROM. Custom programs are useful, especially if they can be permanently installed. The option ROM quickly comes to mind as a storage space, but even the simplest of programs grows in complication by trying to cope with the rules for the option ROM socket and its non-standard hardware. King Computer Services has helped by publishing *Secrets of The Option ROM Revealed*, yet it seems there should be a place for simplicity, even in computing. With the alternate method described here, "built-in" programs are relatively easy to develop and use.

Our initial interest was in building computer-assisted test fixtures operating through the Model 102's expansion port. For this dedicated use, we con-

ceived of the system as managed by both BASIC and machine language programs. As all machine code programmers have learned, using the Model 102 at the ground level offered plenty of opportunities to deal with an unexpected cold start. Realizing that programs permanently stored in EPROM would lower our crash/recovery frustration and make the final version tamper-proof, we explored alternatives. The confusion factor associated with the option ROM forced us to seek other means of EPROM storage.

THE DAWN OF AN IDEA

It dawned on us that we can install a standard EPROM directly in the Model 102 without soldering, using gimmick

**With this method
"built-in" ROM
programs are easy
to develop
and use.**

adapters, or buying special hardware. We can remove the socketed 8k option RAM chip, plug in a programmed 27C64 (pin 1 in the proper direction) and go. No disassembly is needed. The socket is under the hatch on the bottom of the Model 102, right next to the non-standard option ROM socket. With a 24k computer, the socket is already empty. Unfortunately, the Model 100 does not use a standard socket arrangement, so a 27C64 doesn't fit. In fact, we have assigned most of our M100's to field data

```
@8000: 11,08,00,21,85,F6,17,DA
@8008: 15,80,D2,1A,80,2C,1D,C2
@8010: 06,80,C3,1F,80,36,31,C3
@8018: 0D,80,36,30,C3,0D,80,21
@8020: 85,F6,11,08,00,7E,E7,2C
@8028: 1D,C2,25,80,C9
```

Listing 2. The sequence of bytes burned in the EPROM, resulting from Listing 1.

collection duty as dumb terminals or to lab test chores using the printer port, cassette motor relay, and ring input (see Carl Oppedahl's very handy book, *Inside the Model 100*).

This Model 102 RAM chip, denoted schematically as M4, normally expands the computer from 24K to 32K. It can be replaced with a standard 27C64 since the socket pins are directly compatible. The EPROM occupies the same address space as did the RAM it replaces. Granted, there is a sacrifice of available RAM, but the benefits are worth considering. The code located there is permanent and directly accessible through BASIC. Machine code stored in the EPROM is executed in place, just as if it were part of the system ROM; the code is not stored in a .CO file so no double copies exist when executing. There is no direct need to reserve RAM, and a directory slot is not taken up. Even better, an EPROM in this location is usable without learning a book of tricks for working around the obstacles of the option ROM. In fact, if a full 8K of generally usable code is contained in the EPROM, then little is lost by giving up the RAM. Those with dedicated applications for the Model 102 should find this method of EPROM storage a great benefit.

MACHINE LANGUAGE METHODS

There are two different ways to store code in the EPROM: as machine code or as BASIC. You must assemble machine language code to execute within the

```
8000                                ORG 8000H
8000 110008 SPOT: LXI D,8H
8003 21F685          LXI H,0F685H
8006 17             LOOP: RAL
8007 DA8015          JC PUT1
800A D2801A          JNC PUT0
800D 2C             HERE: INR L
800E 1D             DCR E
800F C28006          JNZ LOOP
8012 C3801F          JMP DONE
8015 3631 PUT1: MVI M,31H
8017 C3800D          JMP HERE
801A 3630 PUT0: MVI M,30H
801C C3800D          JMP HERE
801F 21F685 DONE: LXI H,0F685H
8022 110008          LXI D,8H
8025 7E             RPT: MOV A,M
8026 E7             RST 4H
8027 2C             INR L
8028 1D             DCR E
8029 C28025          JNZ RPT
802C C9             FIN: RET
8000                                END SPOT
```

00000 Errors

Listing 1. Reassembly with ORG at 8000H.

absolute address space formerly assigned to RAM, specifically, 8000-9FFF hex. As in all machine language programs, you become responsible for management of the machine. You must consider hardware activity, particularly interrupts whose influence can be unexpectedly felt during calls to the Model 100 system ROM. Since the 80C85 microprocessor requires absolute addressing, you must assemble the code to be PROMmed with its origin (ORG) within the 8K block beginning at 8000. Once burned into the EPROM, a simple call from BASIC puts the code to work, and a final return (RET) transfers operation back to BASIC. You may store any mix, from many separate routines to one comprehensive program awaiting a call.

As an example, suppose you frequently need a routine to convert a decimal number to its binary equivalent. One way is to pull out the March '88 issue of *Portable 100* and revise Frank Schrader's version of DEC2BIN.CO (p. 28, Listing 3). Reassemble with ORG at 8000H. The result of using the Radio Shack Assembler/Debugger appears in Listing 1. The sequence of corresponding bytes is shown in Listing 2. With this sequence stored in a 27C64 EPROM, a call to 32768 (8000H) will put the binary equivalent of

```
10 INPUT "WHAT NUMBER";N 'range 0-255
20 PRINT "BINARY EQUIVALENT IS "
30 CALL 32768,N
40 PRINT:PRINT
50 GOTO 10
```

Listing 3. This BASIC program converts decimal numbers to binary by calling a reassembled version of DEC2BIN.CO on EPROM.

the accumulator on the screen. Fortunately, an accumulator value can be passed with BASIC's CALL instruction. See the essential elements of such a BASIC program illustrated in Listing 3. With the code stored in an EPROM, it's almost as if your computer had been upgraded with a new instruction to print binary numbers. (Obviously, you could develop a BASIC subroutine and resolve the line number and variable name conflicts that invariably arise when trying to reuse any general purpose subroutine.)

Any of the 8085 books and utilities for machine language programming is useful for generating the code to be burned into the EPROM. We use an 8085 development system that runs on a PC and is normally used for control system work. In fact, our original interest in the Model 100 was heightened when we realized that it ran on the same 80C85 microprocessor that we already had adopted for our own systems.

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BASIC METHODS

There are several approaches to storing BASIC programs in the EPROM. One is as a sequence of ASCII codes representing the key-strokes that make up the BASIC program. The sequence required is the sequence of bytes

you would get by PEEKing the contents of the .DO file that is created when a BASIC program is saved in ASCII format (i.e., SAVE "PGM.BA",A). Once this sequence is PROMmed, it may be used by a loader program that sequentially PEEKs each entry, call it V, of the sequence and prints CHR\$(V) into a PGM.DO file opened for that purpose. You may load the file into BASIC (LOAD "PGM.DO"), which converts the ASCII file to tokenized BASIC during the flickering Wait symbol. You may then enter the program on the computer's main menu by a SAVE "PGM" command. As a trivial example, see the sequence of bytes to store the one-line program from Listing 4A in Listing 4B. Listing 4C is a typical loader program to recreate and run the BASIC program stored in the EPROM.

10 PRINT 1;: GOTO 10

Listing 4A. Example of a simple BASIC program. (It fills the screen with 1's.)

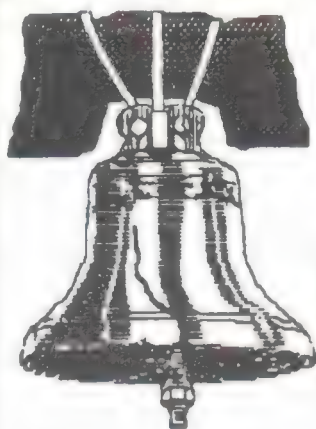
```
@8000: 31,30,20,50,52,49,4E,54
@8008: 20,31,3B,3A,20,47,4F,54
@8010: 4F,20,31,30
```

Listing 4B. The hex equivalent of listing 4A (20 = space, optional).

```
10 OPEN "PGM.DO" FOR INPUT AS 1
20 FOR A=32768 TO 32787
30 V=PEEK(A) 'V=decimal
35 PRINT#1, CHR$(V);:NEXT
40 CLOSE
45 LOAD "PGM.DO",R
```

The program to recreate and run the BASIC program in listing 4A from the EPROM containing data in listing 4B.

Ironically, a BASIC program stored this way forces two copies of the program to coexist, one non-executable copy in the EPROM and one in BASIC. The process is somewhat tedious, and I look forward to some reader suggesting a more direct method for storing BASIC programs. Two come to mind. One, by reading the EPROM and directly generating the appropriate .BA entry in the menu. This might be based on a ROM call that uses parts of the LOAD "PGM.DO"



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command code. Two, by storing the tokenized .BA file sequence of bytes that comprises its memory image. Questions arise: How can *BASIC* be forced to use a selected address space? Will it execute in place to avoid the double copy?

Another possible way to store a program developed in *BASIC* is as a machine code program. The interpreter decodes each *BASIC* instruction by going through the instruction lookup table, followed by the ROM call to execute that instruction. Therefore, it seems plausible to do the lookup and use the resulting series of calls in a machine language program assembled to execute in the space 8000-9FFF as mentioned.

The methods outlined here offer a way to store machine code or *BASIC* programs permanently.

PUTTING IT TOGETHER

For burning the EPROM, we use a commercially available PROM puncher, which receives the executable code from the development system, typically in Intel hex format, and punches the EPROM accordingly. King Computer Services is advertising an inexpensive burner that connects to a serial port. We have not investigated this device, nor its compatibility with, for example, the Radio Shack *Assembler/Debugger*. Perhaps a reader can test this combination or suggest others.

The methods outlined here offer a way to store machine code or *BASIC* programs permanently while avoiding custom service charges, special hardware, and the mysteries of the option ROM socket. Perhaps some ambitious programmer will use this format to market an EPROM full of generally useful programs or routines, which will be as accessible as those in the standard ROM. After all, 8k is respectable space. I would like to see a chip that displays hex from decimal and vice versa, that converts an ASCII file to Intel hex format, that converts the bar code reader into an optical tachometer, that prints the contents of the paste buffer while in *TEXT*, that lists the starting address of each file in the menu, that ...

COMPATIBILITY: Tandy 600 (principles apply to all computers)

Inside the Tandy 600

(Part 1 of 3 Parts)

*Look through this beginner's eye view of a computer—
and the Tandy 600.*

by Stevie A. Stark

Recently while reading a copy of this magazine, I noticed that a lot of the readership were requesting more entry-level information on the computers they were using. So I thought it would be a good idea to write an article on hardware for these readers. This is a subject always overshadowed by software and should help you the reader to dispel some of the mystery about your computer. I have attempted to explain this subject at a level anyone can understand, but you must keep in mind that this is a very complex subject, and I left out some details to make the concepts a little more understandable. In this multi-part article, I'll examine some of the components and subsystems that make up a computer, then the hardware configuration of the Model 600. I'll cover subjects such as the CPU, the memory, and all the Input/Output (I/O) devices found in the Tandy Model 600. If you do not own a Model 600, don't worry—the ideas apply to almost any computer on the market.

THE CPU

Every personal computer on the market, with little exception, contains a *microprocessor*, or *Central Processing Unit* (CPU). Whether it is the 80C88 CPU in the Model 600 or the 8085 CPU in the Model 100, it does the same basic job. The CPU is an LSI (Large Scale Integration) chip containing many thousands of transistors. Its only purpose is to make decisions and control the other elements of the computer. It does this by fetching from memory and executing program statements provided by you, the user. These statements are known as machine code.

THE 80C88

The 80C88 CPU used in the Model 600

is an 8/16-bit CMOS (Complementary Metal Oxide) version of Intel's 8086 (A 16-bit CPU). You will find that CMOS devices proliferate in the Model 600 because of their low power drain.

Let me explain the 8/16 designation. The 80C88 supports an external 8-bit *data bus* (an external bus is a collection of signal lines that a microprocessor uses to exchange information with the components, such as the keyboard or

*The ideas apply to
almost any computer
on the market.*

screen, in the system) and an *internal* 16-bit data bus (used to communicate within the microprocessor itself). The external data bus is capable of transferring data to external system components one byte at a time, while the internal data bus can make transfers two bytes at a time.

The 80C88 has a 20-bit *address bus* (a collection of signal lines used to tell system components where it wants the data transferred to) capable of approximately one million (2 to the 20th power, or 2^{20} , to be exact) unique address codes. This allows a full-blown 80C88 to address over 1 million bytes of memory. It can address 64,000 I/O devices as well. The 80C88 has the ability to handle Direct Memory Access (DMA, a term I'll cover when discussing the floppy disk drive), and interrupts (another term I'll cover in a later article).

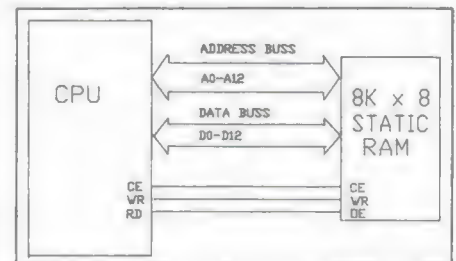


Figure 1. RAM-to-CPU interface.

MEMORY

Memory is a collective term referring to devices that store data and program code. Memory devices are made up of cells, each cell capable of storing one bit of information. Memory capacity is usually given in bytes (one byte is equal to 8 bits).

STATIC RAM

The name RAM comes from "random access memory." This means that data can be accessed randomly—as opposed to sequentially, such as with a cassette tape, for example—where random access is a faster way of using memory. With respect to the Model 600, usable memory comes in only one variety: eight kilobytes in eight-bit bytes (8K x 8) of *static* RAM, or SRAM for short. This means that each memory device (there are four in the Model 600) can hold 8192 bytes (8K) of information. When data is loaded into static RAM, it stays put until it is overwritten or the power is removed (the batteries run down, for example).

DYNAMIC RAM

One other major type is probably more common than SRAM, and that is *dynamic* RAM, or DRAM for short. DRAM is used extensively in non-portable computers such as the IBM PC. It yields higher memory capacity per chip than SRAM but has drawbacks that kept

it out of the Model 600. When data is written into the DRAM, it must be updated or refreshed every 2 milliseconds or so, or else the data contained in it is lost. This makes it harder to design into—which eliminates it from—most battery-backed applications such as the Model 600.

MORE STATIC

Back to static RAM. Figure 1 shows the connections necessary to make the interface between the CPU and (static) RAM.

To access 8K of memory, the CPU requires 13 address lines, A0 through A12. All of these lines form the address bus. The address lines are the signals the CPU provides to let the RAM know which byte in memory it wants to read from or write to. There are eight data lines coming out of the SRAM. These connect to the CPU data bus and are the "highway" for all data into and out of the SRAM.

This covers the address and data lines, but the CPU needs some way to tell the SRAM that it is trying to access it and read data from or write data to it. Luckily, this has been provided for.

Next are the control signals, CE, WR, and OE. CE stands for chip select and is a control input. When the CPU enables (roughly, turns on) this input, the SRAM is enabled and ready for action. If you are going to write a byte of data from the CPU to RAM, this signal will usually be taken to a logic zero (the signal goes low). About the same time this occurs, the address at which you want to store the byte will appear on the address inputs (address bus). The data you want to store should also appear on the data inputs (data bus).

All you need now is some way to tell the SRAM to store the data. The WR input does this. When the CPU causes the WR input to go low, and all of the previously discussed conditions exist in the control signals, the information present on the data inputs will be neatly tucked away in the SRAM, safely stored for you.

Reading a byte from memory takes place much the same way as writing to memory. In reading, when the OE (output enable) line is set to low, the addressed byte in memory is placed on the data bus for the CPU to read in.

READ-ONLY MEMORY

The only other memory device in the

Model 600 is Read-Only Memory (ROM). As the name suggests, you can only read from this memory. This means you cannot store anything in it once it has been programmed, and you, the user, cannot program it—this has been taken care of at the factory.

The ROM is the device that contains all the applications software that comes with the Model 600, including the operating system. The ROM's contained in the Model 600 are 32K x 8 devices and are capable of storing 32 kilobytes (32K) of program code. They are read in the same way as the SRAM, except one more address line is required to access all 32K storage locations.

DMA

Direct Memory Access (DMA) is a process that allows a peripheral, such as the floppy disk, to access memory

the memory banks.

Keep in mind that a peripheral wanting to gain direct memory access will initiate the whole process by making a request to the DMA controller. Figure 2 shows the DMA controller and the floppy drive interface to the CPU.

THE FLOPPY DRIVE

The floppy disk drive is a bulk storage device that accepts a magnetic disk. Data is recorded and stored on the disk for further use.

The several milliseconds required to access information on the floppy (versus RAM and ROM access times in the nanosecond range) make it far too slow for the CPU to use effectively. For this reason, the floppy disk drive is not considered a "primary" memory device, but instead for storing programs or large amounts of data, which later will be

loaded into RAM for use by the CPU.

Referring to Figure 2, you can see that the floppy drive unit interfaces to a WD2797 floppy disk controller. This controller is the buffer between the CPU and the floppy drive unit. If, for example, the CPU wants to load a file from the drive, it communicates this need to the floppy disk controller, which signals the DMA controller to prepare for a disk-to-memory transfer. The floppy disk controller then gets the data from the disk and sends it directly to memory.

FINAL THOUGHTS

So far I have covered several topics basic to the understanding of any computer, including the Model

600. You can now see that the CPU and memory are really the central core of any computer. Thus, connect a microprocessor with RAM and ROM, and you have a working computer.

To function, this computer would need a program written in assembly or some other language, and you wouldn't have any control over what it was doing, but it would definitely work.

In Part 2, I'll explore the I/O devices and subsystems found in the Model 600, and I'll cover the components that let you interact with the CPU and memory.

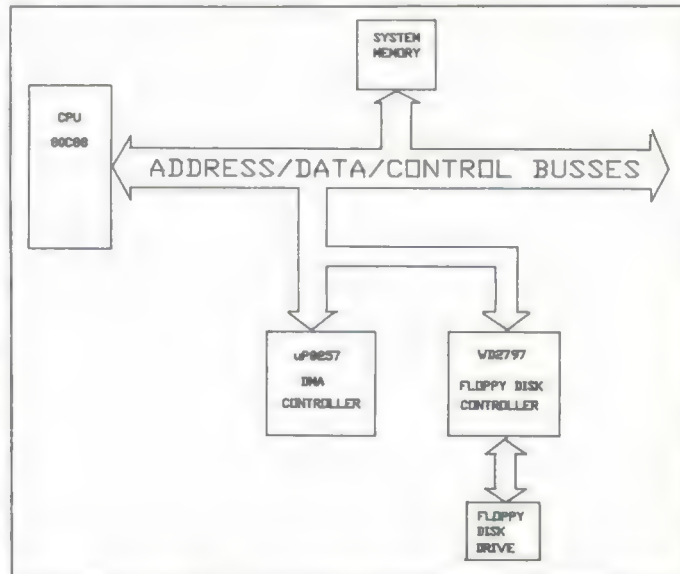


Figure 2. DMA and floppy disk interface.

without going through the CPU. Since this is a difficult for a peripheral to do, controller chips have been developed for just such a task.

The reason for DMA might not be obvious to you, but consider this: DMA allows entire blocks of data to be transferred between the floppy and memory, while not using a DMA would invariably require the CPU to transfer the data one byte at a time.

The DMA controller (uP8257) interfaces with the CPU and the address and data busses. Through control lines, it tells the CPU to release the bus and stop processing. The CPU complies and informs the DMA controller that the DMA now has control of the bus. At this point, the DMA controller generates all addressing information for access into

Wireless Modem In VHF and UHF Versions

The ESTeem Models 85 and 86, from Electronic Systems Technology, are low-cost radio frequency modems. They do not require conventional hardwiring or leased phone lines for communication to computers and peripherals, and use the industry-standard

RS-232C communications port to operate.

The *ESTeem Model 85's* VHF narrow band transceiver provides over 600 radio frequencies for modem operation. Using "Packet Burst" communications and "listen before transmit" techniques,

ESTeem allows networking of up to 255 users on each frequency and performs well in high EMF noise environments. Flow of data is controlled by user-selectable hardware or software handshaking and allows communication between devices that operate at different input/output data rates. The ESTeem incorporates a method of error checking that provides received data accuracy of greater than one part in 100 million.

The *ESTeem Model 86's* UHF narrow band transceiver provides over 4,000 radio frequencies for modem operation. It also uses "Packet Burst" communication and a "listen before transmit" technique to allow networking of up to

255 users on each frequency, performing equally well in high EMF noise environments.

Private data communication is provided by the use of ESTeem firmware High Level Data Control (HDLC) techniques, bit compression and Manchester encoding and the use of over four security codes and communications parameters that allow communication access to the modem. If higher security is required, the units are compatible with asynchronous Data Encryption Standard (DES) encryption peripherals.

ESTeem's effective operating range is from 10 to 15 miles, dependent on line of sight conditions when used with the proper antenna and has an intra-building communication range of approximately four stories on standard steel and concrete structures. The operating range of the modem can be increased by allowing the user to digi-repeat his data through up to three ESTeems to arrive at the final destination. An ESTeem can operate as an operating node, repeater for another node, or both simultaneously for added application flexibility.

Standard features for both models include 4800 bits/second data transfer rate, 2,000-byte data buffer for both transmit and receive data, 12 VDC operation using lower-power CMOS circuitry, and over 50 user-friendly system status messages that are available in hexadecimal output for computer control. The Model 86 is also available with RS-422 input interface.

Factory classes on theory of operation, system design, and application are conducted twice monthly. Price for the ESTeem Wireless Modem, VHF Transceiver is \$1,495.00; ESTeem, UHF Transceiver is \$2,295.00. For further information, contact Electronic Systems Technology, 1031 North Kellogg Street, Kennewick, WA 99336 (509)735-9092. Or circle #61 on your Reader Service Card.



The wireless modems from EST can also function as repeaters.

Compress Your Data with Squish Plus

Squish Plus is a space-making program that doubles the capacity of hard and floppy disks by storing data more efficiently, without changing the content or integrity of your data. It works easily on files of all types, not just spreadsheets. Even while in use, compressed files remain tidily compacted on disk. Files are instantly available, and no extra disk space is needed to "uncompress" them before use.

Squish Plus requires 63K RAM to run, with MS-DOS 2.0 or higher. It is fully automatic, works on-the-fly, and is completely transparent. There's no need to alter your work habits or even use a hotkey. *Squish Plus* is a logical device driver with great reliability and compatibility. Hotkeys and interrupt-traps are not used. There are no potential conflicts with other programs; *Squish Plus* is always well behaved.

Price \$99.95. For further information, contact Sundog Software Corporation, 264 Court Street, Brooklyn, NY 11231 (718)855-9141. Or circle #69 on your Reader Service Card.

"Wireless Computer" from EST



The QuEST provides wireless two-way digital communications between computers or computer peripherals.

The *QuEST* wireless computer is an integration of the NEC PC-8300 portable computer and the ESTeem wireless modem (see Reader Service #60). The *QuEST* provides two-way digital communications between additional *QuESTs* or other computer or computer peripherals using the ESTeem modems.

QuEST can be purchased with an integral ESTeem Models 84SP or 85, depending on the customer's application. The ESTeem

modem located in the base of the *QuEST* unit is identical to the stand-alone unit. The user benefits from all the qualities of the NEC PC-8300 as well as the ESTeem modem.

Prices for *QuEST* start at \$2,015.00. For more information, contact Electronic Systems Technology, 1031 North Kellogg Street, Kennewick, WA 99336 (509)735-9092. Or circle #61 on your Reader Service Card.

Solid State IC Card Drive

HiperDrive 1 lets you combine the portability of laptop computers with the high performance of solid-state IC cards to create Application Specific Information Computing Systems. As an applications developer using IC card technology, your software and data is tamper-resistant, copy protected, easily updated in the field, and not as sensitive to temperature, humidity, vibration and shock as other media.

IC cards can be mailed, handled and transported without concern for accidental erasure by magnetic fields, misplaced fingerprints, 30 weight motor oil, or spilled coffee. Some typical applications include: Portable Financial Planner, Real Estate Contract Writer, On-Site Bid Calculator, Police Report Writer, and Field Service Claims Adjuster.

Card types include EPROM

Fight Modem Troubles with the Road Warrior

Modem communications on the road can be difficult, and connecting your modem can range from difficult to impossible. The *Road Warrior Deluxe Toolkit* from Computer Products Plus, Inc. (CP+) contains all the tools and connectors you need to connect your modem to virtually any telephone system. It includes CP+

Connection, which does electronic interfacing for you, even on the newer digital systems—without interfering with normal phone operations.

All the tools are contained in a custom cordura travel pouch with extra room for your own special tools.

The Road Warrior Toolkit

(without CP+ Connection) retails for \$49.95; the Road Warrior Deluxe Toolkit (with CP+ Connection) for \$139.95. For more information, contact Computer Products Plus, Inc., 16321 Gothard Street, Unit F, Huntington Beach, CA 92647 (714)847-1799. Or circle #68 on your Reader Service Card.

(32K to 256K), Static RAM (batterybacked, 64K to 512K), Electrically Erasable PROM (512 bytes to 8K bytes). They utilize standard MS-DOS drivers, with other drivers available for custom applications. Standard interfaces for Toshiba and Tandy MS-DOS laptops are now available, and models under development include Datavue, NEC, GRiD, and Epson. For more information, contact Adtron Corp., 745 North Gilbert Road, Suite 124-361, Gilbert, AZ 85234 (602)940-0060. Or circle #63 on your Reader Service Card.

FAX for DeskMate

Radio Shack has released the *Tandy FaxMate*, a facsimile board with software using the *DeskMate* graphical user interface. To fax information from within any *DeskMate* application, the user simply creates a cover sheet using the fax software utility, composes the document with any *DeskMate* application and sends it. The process occurs in the background, allowing the user to continue working with the computer. An audio tone signals the fax has been sent.

Tandy FaxMate works with all *DeskMate* applications, including *Lotus Spreadsheet for DeskMate*, *DeskMate Q&A Write*, *Paintshow Plus*, and *PFS:First Publisher*. Through the *DeskMate Desktop*, non-*DeskMate* applications are supported as well. Utilizing the *Tandy FaxMate's* advanced mode, the user can display and print incoming faxes, broadcast a fax to several recipients, poll other

fax stations for incoming faxes and scan printed material using optional hand or page scanners.

The adapter card fits any PC-compatible expansion slot and connects to a telephone line through built-in modular telephone jacks. It transmits data at 4,800 bits per second (bps) with automatic fallback to 2,400 bps. The system includes an 8-bit adapter card, application software, user's guide, and telephone cord. It requires 640 K memory, one floppy and one hard disk drive, MS-DOS 3.1 or higher, a graphics adapter, and a standard rotary or touch-tone telephone line. Suggested retail price is \$349.95. For more information, contact your nearest Radio Shack Computer Center, or contact Radio Shack, 1700 One Tandy Center, Fort Worth, TX 76102. Or circle #64 on your Reader Service Card.

Executive Series Diskette Wallets

Computer Coverup, Inc. has introduced *Executive Series* diskette wallets made of black simulated snakeskin material. This new series is being offered in addition to Computer Coverup's existing line of nylon wallets for 3.5-inch and 5.25-inch diskettes in four colors (blue, silver, burgundy, red).

The new Executive Series come in two sizes for 3.5-inch

diskettes and can hold either three or ten diskettes; the 5.25-inch wallet holds ten. Velcro enclosures keep disks sealed securely. The wallets fit into backpacks, briefcases or coat pockets.

Price not listed. For further information, contact Computer Coverup, Inc., 2230 South Calumet, Chicago, IL 60616 (312)326-3000. Or circle #62 on your Reader Service Card.

Protective Cases for Your Laptop

Alpha Plastics Company has begun offering laptop users an alternative to soft carrying cases with its *VideoGuard* case line. Originally designed for video cameras, these cases have been redesigned and modified to hold laptops. Shells are mounted on hardened aluminum frames that are black anodized and have red accent lines. Included in the design are lightweight molded handles, cold-rolled steel hinges,

and positive locking latches mounted in a steel console. Inside there is convoluted foam in the top and layers of die-cut foam cubes in the bottom.

Sanyo laptop dealers are now carrying the Alpha Plastics carrying cases. For more information, contact Alpha Plastics Company, 9315 Evergreen Blvd. NW, Coon Rapids, MN 55433 (612)786-6940. Or circle #65 on your Reader Service Card.

For Old Times' Sake—TRSDOS

PowerSoft Products has a product of interest to ex-TRS-80 users who now have a PC: Hypersoft's *PC-3* and *PC-4*, Tandy Model III and Model 4 "emulators." The Model III emulator allows you to run all the Mod III systems like TRSDOS, LDOS, DOSPLUS, NEWDOS-80 or MultiDOS, right on your PC. The Model 4 emulator runs most versions of TRSDOS 6. Now you can run previously "unconvertible" programs and games right on your PC-compatible computer—even machine-language programs like

SCRIPSI, *SuperScript*, *PRO-FILE*, *LeSCRIPT*, *PowerMAIL*, *PFS*, etc. Hypersoft has tested many programs and found that most tested programs work with *PC-3* and *PC-4*.

Additional options include *PC-4* with *TRSCROSS*, TRSDOS 6.2, *MODELA/III* ROM image disk, and TRSDOS 1.3 for *PC-3*. For more information, contact PowerSoft Products, 4951 Airport Parkway, Suite 700, Dallas TX 75248 (214)458-1197. Or circle #67 on your Reader Service Card.

DEFUSR appears monthly to answer your questions about Tandy notebook computers.

Send your queries to: DEFUSR, PORTABLE 100,
P.O. Box 428, Peterborough, NH 03458-0428.
Please enclose a stamped, self-addressed envelope for our reply.

TRAPPED DISK FILES

Is there any way to change the file type (extension) of a file on a disk, using FLOPPY?

I saved several files having non-standard extensions, by poking values into the directory in high memory before saving. Now the files will not load. Instead, I get an *Invalid File Type* error. These files are all text files. All attempts to rename these files and change the extensions have failed. Is there any way I can retrieve them?

Also, are there any technical references on accessing codes to the Portable Disk Drive 2 (PDD-2) through machine language? I do not want to have to disassemble FLOPPY.

Michael Schmidt
Columbia, MO

The PDD itself cares little about file name formats, permitting almost anything up to 24 characters. But FLOPPY, written specifically to work with Tandy notebook computer files, is a bit more fussy. (Not quite fussy enough, as we'll see!)

In Tandy notebook computers file type is critical, because .BA, .CO and .DO files require different treatment. By checking the first character of the extension, the computer knows how to handle a given file (one with no extension is assumed to be .BA type). The second character can be changed to make the name more descriptive, as with the .CW, .CT and .CA extensions used by Super ROM applications.

Like the computer, FLOPPY is cautious, loading only files whose extensions begin with B, C or D. It's equally cautious in preventing the rename function from changing an extension.

Too bad it's not that fussy when saving! It gladly saves files with non-standard extensions. This design flaw—the willingness to save what it will later refuse to

load—is what got you into this mess.

Fortunately, programs to recover "lost" disk files can be found on CompuServe and probably GENie as well. Search the data libraries on those services. A message to the sysop (system operator) will steer you toward any help you might need. And don't forget to say thanks!

Though you don't have to disassemble FLOPPY—command protocols are in the PDD-2 service manual, available through Radio Shack—it's a good way to learn how it's done. Why re-invent the wheel?

-MN

REDEFINE THE KEYBOARD?

I am delighted that Portable 100 has survived. The vitality of the M100 community testifies to the extraordinary qualities of that machine and its amazing potential.

As someone who has to write a lot in foreign languages, I have one specific question. Is there a simple way to make life easier for those who need foreign characters all the time? They can be accessed with the GRPH and CODE keys, but you cannot type very fast that way.

There must be ways of redefining keys, even if one has to go into machine language to do it. I seem to remember references to Dvorak keyboards for the M100 a long time ago, but I have never seen any advice on how to get at least a partial foreign keyboard. Preferably, one should be able to toggle this on or off, as one can with national keyboards on my IBM desktop and with my own keyboards that I have put together with Superkey.

I am trying to learn enough about assembly language programming to do it myself, but if it has been done by somebody else, I would love to know about it. I imagine, for example, that there

must be a lot of M100 users in Canada who have come to grips with this problem.

Göran Ohlin
United Nations
New York, NY

After writing Dvorak Keyboard System (distributed by Granite Street Portables; see their ad), I had planned to produce several foreign language keyboards and special keyboards for handicapped users. Unfortunately, I never had time.

The challenge is in handling system interrupts, which can cause the computer to misinterpret keystrokes occasionally. I spent more than six months devising a technique that never misinterprets a character. Using that technique, foreign language conversion would add another level of complexity, but should be quite possible. I still hope to pursue the project, but who knows when that might be?

Meantime, KEYSER, from The Covington Group, can assign any character to any key, but has some problems, including poor interrupt handling. Still, it might meet your needs. The last address we had for Covington: 4519 Perry Ave. N., Minneapolis, MN 55422. Phone (612)537-4910.

-MN

"GREENHORN"

A fellow member of a local computer club gave me a copy of the April '89 edition of Portable 100. It is certainly an interesting and informative magazine.

As I read, I became emboldened to address this letter to you. Although several years ago I purchased a Tandy 100 computer, and then the appropriate disk drive, I'm ashamed to admit that I still have not been able to get going in using it.

I did make a valiant effort—working my way through almost half of the

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manual that came with the machine. Later, I also purchased David A. Lien's book, *The TRS-80 Model 100 Portable Computer*.

My problem is that I am very busy as hospital chaplain and have precious little time to "just play around" with the computer, and thus learn how to employ its possibilities. In my frustration I even took a brief introductory course in computer use at a local college. The trouble was that we worked with an IBM computer, not a Tandy 100!

I'm writing to explain that my immediate need is for assistance in family financial accounting. Is there any source of available software to which I could turn for help in that area? I also have in hand Vol. 5, No. 3 of *Public Brand Software* as published by the company of the same name at P.O. Box 51315, Indianapolis, IN 46251. Is there anything comparable for Tandy 100 users?

Finally, in the April '89 edition of *Portable 100*, I have read the interesting article, "Not For Beginners Only." It prompts me to ask, have you ever published—and if so, may I still purchase photocopies of—any prior articles on "For Beginners Only?"

My thought is that if I can secure guidance on exactly how to accomplish some task I need to get done, I can then branch out into a more extensive use of my computer. I have not yet purchased a printer, but Radio Shack here in Toledo now has them on sale. If I can learn how to use the computer, I obviously will need a printer, but not until then. I'm definitely a greenhorn and will appreciate help!

Clarence P. Miller
Toledo, OH

If, by "family financial accounting," you mean a program to keep track of a family budget (i.e., rent, car payments, utilities,

etc.), I know of nothing commercially available at the moment. I'm sure some programs could be found in back issues of *Portable 100* and *PICO*, and I'd suggest checking our Article Index to see what's there. For example, I know of one published program to aid in reconciling a checkbook. You'll probably find others. If you can find time to learn to use the CompuServe and GENie on-line services, there's a good chance you'll find something useful.

For easy tracking of tax records, check out WEETAX™, *The Weekly Tax Program*, by Software Versand (see their ad).

A simple spreadsheet keeps track of my own personal state of financial disaster. Spreadsheets are very flexible; you can adapt one to most any situation. P100 published a BASIC spreadsheet some time ago, which you can download from the *Portable BBS* or, if you're not up to speed with TELCOM, you can type it in from the magazine. It's very good, but it's slow and uses up some of your



**Club 100 (see their ad)
has a large collection
of programs
available on disk.**



RAM. Alternatively, Lucid on PCSG's Super ROM (see their ad) is the unchallenged best spreadsheet for Tandy notebook computers. Being a ROM-based machine language program, it's very fast, versatile, and uses no valuable RAM.

Club 100 (see their ad) has a large collection of programs, available on disk, and has other products as well. You might even find the financial package you need.

As for a printer, you'll eventually need one, and probably the sooner the better. Don't worry, Radio Shack will continue to have sales. Meanwhile, don't overlook the non-Tandy printers like those from Kodak, Toshiba, and the Stafford Matrix.

Bill Brandon's FULL POWER column started with the April '89 issue, so you haven't missed any. Although we've never run a "For Beginners Only," there's been a lot of good information in past issues. Again, let me recommend the Article Index. It's only \$9 and covers all P100 articles from the very first in September 1983 through the Summer 1989 issue. For any issues that are no longer

available, we can still provide photocopies of the articles.

-MN

STOP-GAP SCRIPSIT FIX

Re William J. Spry's "SCRIPSIT WITH D/VI" query (DEFUSR, Oct. '89):

SCRIPSIT 100 omits the end of some files, before completion, due to a bug in the data input buffer logic. I have tried tracing the BASIC execution in hopes of fixing the problem, but to date without success. The stop-gap solution is to press ENTER 20 or 30 times at the end of the input file. (Ugh!) This pads the input buffer, forcing SCRIPSIT 100 to process the desired output.

I had other problems with the as-distributed SCRIPSIT 100 and changed it extensively, including CORTN6.CO:

1. a sentence-period terminating an output line now prints at the right margin, instead of two spaces left of the margin;
2. ":", "+", and "." are preserved;
3. imbedded printer code sequences ^P mm ... nn^P are accommodated and converted to control codes, while preserving the justification option;
4. lines containing elongated characters are justified correctly;
5. speed is increased, by eliminating BASIC computation of word splits for space insertions;
6. new dot commands: .Bn copies an LCD screen dump to printer; .In indents (O> overhang and O< normal); .Wn controls the line length; .Xn controls extra line on paragraph; and .Zn labels the first page as page n;
7. WSPEC file names and input file names are menued.

I considered writing a *Portable 100* article on these modifications, but it would be difficult for other users to merge them with their own copies of SCRIPSIT 100.

Thomas M. Olsen
Phoenix, AZ

Thomas Olsen, president of Software Versand, is the author of WEETAX™, *The Weekly Tax Program* (reviewed in *Portable 100*, Mar. '89; see ad in this issue). I haven't asked him, but if users needing these fixes were to write to him at the address in the ad, he might be persuaded to merge the fixes into users' programs. (On the other hand, he might be persuaded to shoot me for suggesting this! We'll have to wait and see.)

Thanks for the helping hand, Tom!

-MN

COMPATIBILITY: All notebook computers (with some variations)

TELCOM—Part 1

The Model 100 owes most of its success, in my opinion, to the combination of two features: *TEXT* and *TELCOM*. The 100 would be an interesting and useful machine if the designers had stopped after *TEXT*. But it was the ability to transfer information easily back and forth with other computers and devices that sustained the interest and extended the uses for many owners.

TELCOM, and the built-in communication hardware it supports, allows you to connect your Model 100 to another computer, either directly or through the telephone system. Once the connection is made, you can send files back and forth between computers. You can even use your Model 100 to control another computer from miles away. *TELCOM* also makes it possible for you to communicate with other devices; the most common "other devices" are serial printers and Tandy Portable Disk Drives.

TELCOM gives you more than just another way to get information in and out of the computer, though. What you get is more flexibility to communicate—even across continents—with other human beings. The fact that computers large and small, on-line services, or "intelligent devices" are involved makes certain transactions simpler or more productive, but it does not take away from the basic human function being served.

What good is this ability to telecompute? Ask anyone who needs to stay in touch with the office, to send information, or to have access to data quickly. Reporters, network anchors, sales reps on the road, executives making deals, and stockbrokers—all were quick to discover

the value of *TELCOM*.

PREPARATION

In the next several columns I'll show you how to put *TELCOM* to work. Specifically, you'll see four different methods for transferring data between computers via *TELCOM*. I'll outline the steps for making these transfers and discuss what to do when things go wrong. We'll look briefly at using *TELCOM* to communicate with other intelligent devices. Along the way I'll give you some tips and

on-line service, bulletin board service (BBS), or your office computer. It is also needed if you want a quick and dirty way to transfer files between Model 100's.

- An RS-232 cable—also called a serial cable—and a null modem (for more on null modems, see Sept. '88, p. 19). If you have to send data to a serial printer, to another computer, or to an intelligent device (such as certain telephone switching equipment, most typesetting machines, or high-tech industrial equipment), these two devices are must-haves.
- Acoustic cups. Though often scorned for their clumsiness, there is no substitute for these if you have to connect to an on-line service or your office computer via pay phone from an airport.
- Home-made connection kit. If you spend a lot of time on the road, in hotels or other people's offices, you need this.

The main item in the home-made kit is a two-meter length of telephone wire (the kind that runs from the wall to the phone) with a modular jack on one end and alligator clips on the red and green wires at the other end. Your kit should also contain a small slot-blade screwdriver and possibly certain other useful do-it-yourself gizmos. I'll explain the use of these items in a later column.

IF ...	THEN ...
1. You are not getting anything on either computer's screen, AND you have checked all the mechanical switches ...	1. Check to be sure both computers are using the same baud rate.
2. You are getting graphics characters and totally unreadable "trash" on the LCD ...	2. Check to be sure both computers are using the same word length.
3. You have checked the word length and found it correct, but are still getting total trash ...	3. Check to be sure both computers are using the same parity.
4. You can read some of what is coming in, but it is mixed with trash ...	4. You have a problem with the connection or the telephone line.
5. You can't see any of what you are typing, but you can see what is coming from the other computer ...	5. The other computer is using "half-duplex" and you are using "full duplex." (Press F4.)
6. You get two of everything you type, but what is coming from the other computer is correct ...	6. The other computer is using "full-duplex" and you are using "half duplex." (Press F4.)

Table 1. Troubleshooting guide for *TELCOM*

tricks you won't find in the manuals.

You will need a few accessories. Depending on your uses of the Model 100 you may find the following equipment to be essential:

- A modem cable. This cable, which you can get from Tandy, is needed if you intend to connect via phone line to an

TELEPHONE TYPES

The equipment in this list will allow communication over most analog phone systems and to most computers. An analog phone system is a plain-vanilla setup, such as you probably have in your home or as is found in hotels and some businesses. If your phone is beige and has no

OUT OF RAM? NO DISK SPACE? GET FAST!

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Circle 21 on reader service card.

fancy "conference" or "transfer" features, it's probably analog, and you need only the simplest equipment to connect your Model 100.

If your phone system is digital (ROLM, Spirit, System 75, Toshiba, NEC, and others), you will need another type of device, to be covered in an upcoming product review.

If your phone has a lot of programmable features or has an LCD display, it is definitely digital. The signals sent over the phone line by a modem (any modem, not just the Model 100's) confuse digital

systems, and they will break the connection. The "other device" (CP+ Connection, by Computer Products Plus) fools the digital system into treating the data signals as voice transmissions. I don't know how it does this, to tell you the truth. I just know it works and keeps you from having to pay the phone company extra money for a dedicated line.

This problem with digital phone systems is one of only two important limitations on the Model 100's ability to transfer information. The other limitation has to do with the kind of information the

TELCOM PARAMETERS

Four factors control the transfer of data between computers. These are usually called communication "parameters." They appear in abbreviated form in the upper left-hand corner of the LCD screen when you select TELCOM, along with two other factors. You can also type STAT (or just press F3) and then press ENTER to see them.

Suppose you see the notation M711E,10pps. The first character is always either the letter M or a number between 1 and 9. This indicates the rate at which the computer transfers data and the path it uses. A number indicates that the transfer takes place through the connector

marked RS-232C (sometimes called the serial port or serial connector) on the back of the computer. In our example, the letter M indicates the transfer will take place instead through the connector marked PHONE, using the internal modem. When the Model 100 is connected to a telephone system and is using its own modem (M), the transfer of data is always performed at a rate of 300 baud. This rate is about equal to one page of single-spaced material every two minutes. Numbers indicate transfer rates from 75 baud to 19,200 baud, as shown in the manual for the Model 100. The higher the number, the faster the transfer rate. The

Model 100 can transfer. You must remember that any file to be sent by the 100 (uploaded) must be a .DO file; coming the other way, the Model 100 will automatically save any incoming data (download) as a .DO file. You will have to convert programs (.BA and .CO files) to .DO form before sending, and from .DO to .BA or .CO after receipt. This is not something that you have to sweat over—the 100 will do the .BA/.DO conversion, and there are utility programs to do the grunt .CO/.DO labor for you. This will also be discussed later. For now, just remember that “passing data” means “sending .DO files.”

SERIAL DATA TRANSFER

Passing data between the Model 100 and another computer or device is really very simple. The basic physical requirement is to get two wires connected between the machines. The other basic requirement is to make sure that both machines are sending the data in the same format. The quickest and dirtiest transfer we'll discuss is moving data files between two Model 100's using modem cables. Besides being a useful trick to know, it is also the easiest way to demonstrate *serial data transfer* (the formal name for what *TELCOM* does).

Begin by attaching modem cables to both machines. When you bought the modem cable, one lead was inserted into a “double female” modular adapter; have one of these attached to the beige

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cable from one of the Model 100's. Plug the beige cable from the other Model 100 into the other side of this adapter. Let the silver wires dangle, unconnected. Whenever you are having trouble transferring via the modem cable, the very first thing to check is to be sure the beige cable is the one going to the other computer.

On the left side of each Model 100 you will find two switches. On both machines, set the *DIR/ACP* switch to *DIR*. This setting tells the machines to send data through the *PHONE* plug, and that you will be using the modem cable for your connection rather than the acoustic

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cups. If you have this switch set incorrectly on either machine, the only indication you will get is that absolutely no data gets transferred. Therefore, if you are having trouble with your transfer, this is the second thing to check: Is the *DIR/ACP* switch set correctly?

You have now got a two-wire physical connection between the two Model 100's. All the information (actually electrical pulses) that passes from one to the other will travel through two wires in the modem cables. There are four wires in the cables, but only two are used. If you are familiar with standard telephone wiring,

Model 100 can upload at any of these speeds, as long as the other computer can keep up. (Note that although the Model 100 can receive data at rates of up to 19,200 baud, its slow LCD screen scrolling causes it to tell the sending computer to pause frequently, making the actual rate of data transfer roughly equivalent to 600 baud.)

The second character indicates how many pulses will be sent to represent each character. This can range from six to eight. In our example, seven pulses is sent for each character of text transferred. Using seven-bit words permits a primitive kind of “error-free” transfer, and al-

lows control codes to be sent. Normally, though, eight-bit words are used; eight-bit words allow graphics characters to be sent.

The third character indicates the parity checking scheme being used. Without going into detail, parity is another method for improving the accuracy of transmissions. Parity can be Even, Odd, or None. The Model 100 allows you to Ignore parity, which is useful if you don't know what the other computer is set to.

The fourth number shows how many stop bits have to be sent after each character. This is how the other computer knows where one character ends and

another begins. Stop bits can number one or two. In the example, the Model 100 is using one stop bit, which is normal.

The fifth character is always either *E* or *D*. This refers to whether the Model 100 will be able to pause sending or receiving temporarily to allow catching up. This scheme is sometimes called *XON/XOFF* flow control.

The final part of the status is always either 10 pps or 20 pps, and refers to how fast the Model 100 will dial your telephone.

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it is the red wire and the green wire that are used; the black and yellow wires are not required.

DATA FORMAT

The next problem is to make sure the computers are using the same format for sending and receiving data. This involves several steps. Looking back at the left side of each machine again, set the *ANS/ORIG* switch on one to *ANS*. On the other machine, set this same switch to *ORIG*. The machine set to *ANS* is now the *host* computer. When the Model 100 communicates by using its built-in modem, the machine "talks" using one of two standard frequencies (call them "high" and "low") and "listens" on the other. Setting this switch determines which computer talks high and listens low, and which one talks low and listens high. If you have both machines set the same way, no data will pass between them. Therefore, this is the third thing to check in case of trouble: Are the *ANS/ORIG* switches set appropriately and oppositely on each machine?

Turn both machines on and select *TELCOM* from the main menu. At the top of the screen, you will see some letters and numbers, such as *M711E,10pps*. This is the *TELCOM status* for that machine. Status describes the speed at which the machine transfers and receives data, the format it uses, and the speed at which the machine dials your telephone. These characteristics are usually referred to as communication *parameters* (see the sidebar).

At this point, most important for you to know is that both machines should be showing the same status; if they aren't, they won't be able to transfer data. Table 1 shows how to sort out mismatches. Your status should be set to *M7N1E* on both machines. If it isn't that way already,

you can just type *STAT* (or press *F3*), and then type *M7N1E* and press *ENTER*. Don't worry about the 10 or 20pps business for now.

You're almost ready to communicate, but there's one other detail for your attention. Turn on the label line (by pressing the *LABEL* key). Make sure the word *Full* appears above *F4* on both machines. *Full* stands for "full duplex." In full duplex, each machine displays characters it re-

*This switch
determines which
computer talks high
and listens low,
and which one
talks low
and listens high.*

ceives and repeats these back to the other computer; but neither machine will show the characters it sends. Got that? The characters you see on your screen when you are sending data in full duplex do not come from your machine, but from the other computer. Weird! Check Table 1 to eliminate any problems.

On both machines, press the *F4* (*Term*) key; the computers are now connected to each other through their modems. What is typed on one machine should appear on the screen of the other. (If it doesn't, go back and check all the settings shown above.)

DOIN' IT

Now, let's try moving some data! On the machine containing the file you wish to transfer, press the *F3* (*Up*, for "upload") key, type in the name of the file, and press *ENTER*. The Model 100 prompts *Width:*. This is the number of characters per line, and may be up to 132. A width of 80 is usual and safe; every eightieth character will be followed by a carriage return in this case. Type your response, but don't press *ENTER* yet.

On the other (receiving) machine, press *F2* (*Down*, for "download"), type the name you want the received file to have, and press *ENTER*. The word *Down* on the label line changes to reverse video. From this time on, everything that comes into this Model 100 through the serial port will be saved to the RAM file you just specified.

Now press *ENTER* on the sending machine. The word *Up* on the sending machine changes to reverse video, and the file is transferred. When the transfer is complete, the word *Up* goes back to normal video. Press *F2* on the receiving machine to break out of downloading mode. Press *F8* on both machines, answer *Y* to *Disconnect?*, press *F8* again, and disconnect the modem cables.

NEXT MONTH: More connections, more tricks ...

Valeas, qui legis quod scripsi!

by Bill Brandon

Bill Brandon is a 43-year old father of two. He works for Atmos Energy Corp., a natural gas distribution company in Dallas, Texas. Bill is also a sysop on CompuServe's Data Processing Trainers Forum. You can leave E-mail for him on the Portable BBS, or on CompuServe (71316,516). (Skate or die, dude.)

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